

Con. 3534-11.

(REVISED COURSE)

RK-2676

May 11
(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Answer any four questions out of remaining six questions.
 (3) Assume any data if necessary and clearly state it.

1. Solve any four of the following :

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(a) Determine the energy of the signal. $x(n) = (0.5)^n u(n)$ (b) Find 4-point DFT of following signal $x(n) = \cos\left(\frac{n\pi}{2}\right)$

(c) Find Z - transform of

$$x(n) = (n+1)a^n u(n) \quad \text{Specify its ROC.}$$

(d) Convolve $x(n)$ and $h(n)$

$$x(n) = \{1, 3, 5, 3\}, \quad h(n) = \{2, 3, 1, 1\}$$

2. (a) Determine the impulse response and step response of the following causal system.

$$y(n] = 0.6y(n-1) - 0.08y(n-2) + x(n)$$

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(b) Discrete time LTI system is described by following equation-

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$$y(n] - 0.6y(n-1) = x(n]$$

Find - i) Transfer Function

ii) Pole Zero Diagram

iii) Frequency response of system

iv) Type of filter

3. (a) Find DFT of the following sequence $x(n) = \{1 + 3j, 2 - 2j, 2, 3 + j\}$ 10

From above result find DFT of the following sequences.

$$x_1(n) = \{1, 2, 2, 3\} \quad \text{and} \quad x_2(n) = \{3, -2, 0, 1\}$$

(b) Derive the Radix-2 DIT-FFT for a 8-point DFT. 10

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Con. 3534-RK-2676-11.

2

4. (a)

$$H(z) = \frac{z^2}{z^2 - \frac{1}{6}z - \frac{1}{6}}$$

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Let the input be $x(n) = 4u(n)$ & initial conditions be $y(-1)=0, y(-2)=12$

Determine (i) Zero state Response

(ii) Zero input response

(iii) Total response

(b) Find all possible inverse Z-transform of --

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$$X(z) = \frac{z}{(z-0.25)(z-0.5)}$$

5. (a) Design a linear phase high pass FIR filter of 6th order with cut off frequency 10

$\omega_c = \frac{\pi}{2}$, using hanning window.

(b) Design a digital low pass Butterworth filter for the following specification 10

Pass band gain attenuation = 0.9

Stop band gain attenuation = 0.1

Pass band frequency = 0.3π

Stop band frequency = 0.75π

Sampling frequency = 10 KHZ

Use bilinear transformation method.

6. (a) Obtain the cascade and parallel realization of 10

$$H(z) = \frac{(1 - z^{-1})^3}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{8}z^{-1}\right)}$$

(b) Find DFT of following sequence using DIT-FFT 05

$$x(n) = \{7, 2 - 2j, 4, 2 + 2j\}$$

(c) Find IDFT of sequence $X(K) = \{3, 4, 5, 6\}$ using DIF-FFT. 05

7. Write short notes on- 20

(a) Impulse variance method

(b) Features of DSP processors

(c) Application of DSP in biomedical field.

(d) Classification of Systems.